Hand delivered 7/9/80 to GM

Notice of Intention

to

Commence Mining Operations

Escalante Silver Mine
Enterprise, Utah

Ranchers Exploration & Development Corporation
P. O. Box 6217
Albuquerque, New Mexico 87197

July 2, 1980

Tailings Pulp

Upon completion of filtering, the barren filter cake will be re-pulped with reclaim water from the tailings dam, to approximately 35% solids, and pumped through a 4" diameter pipeline to the tailings dam, as hereinafter discussed. The tailings will contain approximately 545 ppm. of total CN, of which 142 ppm. is free CN. Additionally, the tailings will contain lime added during milling, and the other minerals in the ore not recovered during milling. See the enclosed sheet regarding other natural elements in the ore reporting to the tailings (Section P).

9.5.2 Tailings Pond

The tailings pond will be located about 1 1/2 miles west of the mill in a natural basin. The site has been the subject of detailed geotechnical studies (see enclosed F. M. Fox report Section N "Geotechnical Investigation for the Proposed Mill and Tailings Disposal Area"). The site was selected due to its remoteness from habitation, farming, the mine itself, and because of its location on the leeward side of small hills. Its geotechnical suitability for total containment of the tailings and associated solutions, and the distance to the ground water table is also favorable. Other important considerations in site selection were its lack of visibility, relative unsuitability of the land surface for other beneficial uses (grazing, etc.), and its ability to be reclaimed upon termination of operations.

The site is approximately three miles from the nearest irrigation well, and about four miles from the nearest habitation.

The site was extensively test-drilled for geotechnical information, and both laboratory and field tests were undertaken. F. M. Fox and Associates have concluded that by using re-worked native soils for a pond liner impermeability (i.e. 10^{-7} cm/sec.) can be achieved. Fox predicts that the maximum migration of solutions will be to 130' below the pond liner, and migration of only about 90' during milling operations. At these elevations, the specific capacity of the soils will preclude further migration. The water table in this area, based on extensive ground water monitoring near the mine, is between 300' and 350' below the pond liner.

The constructed earthen tailings dam has been designed with a static safety factor of 2.80. The details of the construction and Fox's other findings are found in the referenced report.

The facility is being designed as a "zero" discharge facility; i.e. no tailings or tailings solutions will find their way into the groundwater. 100% of mill tailings and tailings solutions will be contained in the facility, and evaporated, to some extent, over time. In addition to the detailed care to be given to the design and construction of the tailings facility, the entire perimeter will be fenced with 8' high hogwire fencing, and monitoring wells will be installed to the groundwater table.

Three of these wells will be located downstream of the dam, and one will be located upstream. The groundwater monitoring

program recommended by F. M. Fox and Associates will be implemented. Ranchers will also drill angle holes underneath the tailings pond periodically (approximately every two years) in order to observe the downward migration of solutions, if required. These holes will be drilled in such a manner that they themselves will not act as a conduit to the groundwater table. If the migration of solutions indicates that the F. M. Fox conclusions are erroneous, which we believe to be highly unlikely, we are prepared to install a chlorine-kill system in the mill in order to pretreat the tailings. Such systems are in use where tailings are being discharged into streams and lakes in Canada. However, it should be emphasized that the ultraviolet rays of the sun will destroy the vast majority of the CN. Ranchers has estimated that about 75% of the CN can be destroyed by this means over a two-month period.

Earthquake resistance and probable maximum floods have been taken into account in design of the dam. The layout is designed to minimize natural maximum storm runnoff into the pond. The maximum runoff from the total of 266 acres draining into the facility will raise the fluid level by 1.63 feet. A minimum freeboard of 5 feet is to be maintained at all times, to include end of project freeboard.

The pond is designed to be constructed in three stages, each stage accommodating 1 million tons of tailings. With the present ore reserves, we anticipate constructing only two stages. The second stage would be constructed in year 5 of mill operations.

The tailings pond is expected to contain approximately 1.7 million tons of tailings. The tailings will be delivered in the 4" ø pipeline at 35% solids by weight, and will achieve a density of 65% solids almost immediately. The decanted water will be recycled to the mill for repulping new tailings off the last drum filter. A terminal density of 75%-80% is ultimately expected.

It should be noted that the tailings themselves act as an impermeable liner, due to the extreme fineness of grind and thus assist in the prevention of solution migration. The seepage calculations made by F. M. Fox on the tailings were based on a grind of 80%-200 mesh, whereas the actual grind is 80%-325 mesh. The calculations were also based on 1' of water over the top of the entire tailings. Consequently, the calculations, and thus the maximum seepage front of 130', are very conservative.

The enclosed F. M. Fox and Associates report goes into the details of site investigations, field and laboratory tests, design considerations, and construction standards and specifications. Wright Engineers of Vancouver, B.C., who are the project engineers, are following Fox's recommendations in their detailed design and development of construction specifications. The enclosed drawings show a cross-section of the tailings dam with a down-stream slope of 3:1. This may be excessive, and we would this meets with the State Engineer's approval. The static safety factor with a 2:1 slope is 2.15.

FOX Consulting Engineers and Geologists

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GEOTECHNICAL INVESTIGATION FOR
THE PROPOSED MILL AND TAILING DISPOSAL AREAS
ESCALANTE PROJECT
IRON COUNTY, UTAH

Prepared For

Ranchers Exploration and Development Corporation

May 14, 1980
Job No. 1-2762-3106

additional test holes. It is estimated, however, that the water table lies 300 to 350 feet below the impoundment area.

12.0 EMBANKMENT SETTLEMENT

A finite element computer analysis was used to predict settlement beneath the embankment. Settlement calculations are based on average wet densities, consolidation tests, triaxial shear strength tests, and observations made during the drilling program. The critical maximum section was used in this analysis.

Foundation settlements on the order of 0.6 feet can be expected and should be considered in the design and construction of the tailing impoundment. Based upon the consolidation test data, it is estimated that most of predicted settlement will occur during construction and filling of the impoundment facility.

13.0 SEEPAGE ANALYSIS

Our seepage analysis follows the procedure outlined by David B. McWhorter and John D. Nelson in "Unsaturated Flow Beneath Tailings Impoundments" in Uranium Mill Tailing Management Volume I, Proceedings of a Symposium, November 20, 1978, at Colorado State University. Their paper brings together analyses for flow through partially saturated media originally developed for problems in petroleum engineering, soil physics, hydrology, irrigation, and drainage.

A typical cross section used for this seepage analysis is shown in Figure 4. The calculations are presented in Appendix F. Seepage calculations were made using permeabilities of 2.44×10^{-5} cm/sec for the foundation material, 5.67×10^{-7} cm/sec for the liner, and, 1×10^{-6} cm/sec for the tailings. It was assumed that the water level in the tailings pond would be maintained

at a shallow depth by evaporation and a mill return line. Since the placed tailings will have low permeability, the seepage rate decreases as the tailings depth increases. An average tailing depth of 27 feet was used.

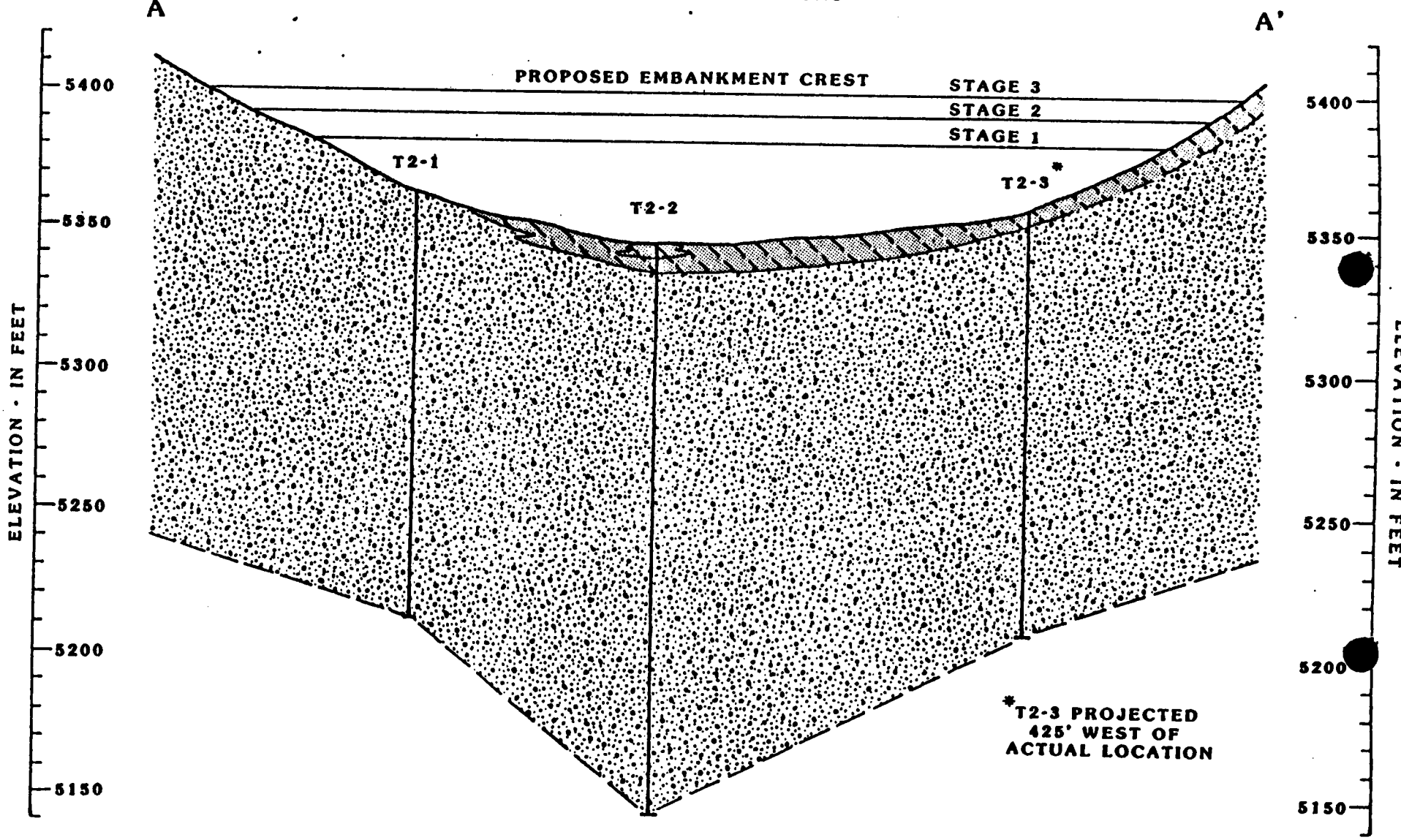
After ten years, a wetting front is expected to advance to a depth of approximately 90 feet below the liner. After tailings placement has ceased (10 to 12 years), the water will continue to spread. By assuming that the water will go downward only (in reality it will spread laterally also), and spread until the soil is at its specific retention (residual volumetric saturation), a maximum water penetration of approximatley 130 feet beneath the liner is calculated. An on-going ground water investigation conducted by Dames and Moore in the adjacent Escalante Valley indicates that the water table is approximtley 300 to 350 feet beneath the liner elevation.

In this situation, the tailings will act as an additional liner since the tailings permeability is about 1×10^{-6} cm/sec or lower. The tailings permeability is the most significant factor in the seepage calculations, therefore, if the chosen tailing grind is finer than that which was tested, the seepage will be reduced. During the first two years it will be critical to keep the pond depth as shallow as possible as higher heads will significantly increase the early seepage rates.

14.0 SLOPE STABILITY ANALYSIS

According to guidelines established by the Committee on Earthquakes of the International Commission of Large Dams, a conventional pseudostatic method using a constant horizontal seismic coefficient selected on the basis of the area seismicity can be used to predict embankment stability. Therefore, a computer modeled modified Bishop slope stability analysis was conducted on the critical maximum section of the embankment to determine the

NOTE: SEE APPENDIX C
FIELD INVESTIGATIONS FOR
LITHOLOGIC DESCRIPTIONS



HORIZONTAL SCALE: 1" - 300'

CROSS SECTION - PROPOSED EMBANKMENT LOCATION

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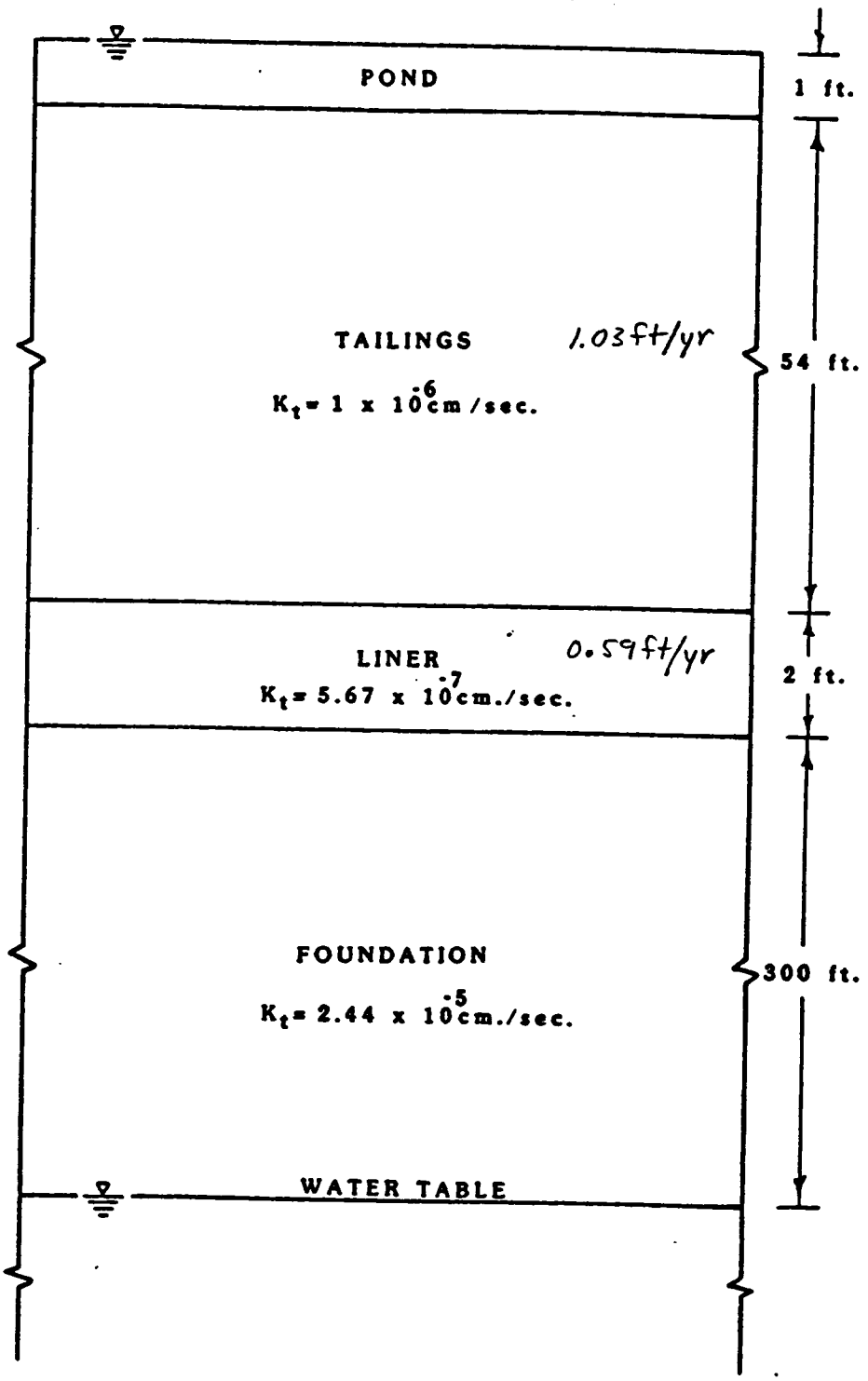
Figure	3



NOT TO SCALE

SEEPAGE CALCULATION BOUNDARY CONDITIONS	Job No: 1-2762-3106
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	Figure 4

WRIGHT ENGINEERS LIMITED

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ESCALANTE SILVER MINE
PROJECT NO.: 1045
TAILING DISPOSAL SYSTEM
FOR U.D.O.G.M. PERMIT
JUNE 17th, 1980

1. GENERAL

Tailing material resulting from the milling operation will be transported through a pressure pipeline and discharged into a storage pond. The primary function of the pond is for the storage of tailing solids. The secondary function is to provide temporary storage of water which after a short period of clarification, is drawn off from the pond for re-use in the milling plant.

The basic objective of the whole system is to achieve zero discharge of tailing material into the environment. The system, which includes a tailing pipeline, a reclaim pipeline, a storage pond and earth dam, will be designed to be self-contained.

2. TAILING QUANTITY & QUALITY

The mill will process an average of 500 short tons per day of ore and produce an average solid output of 23.0 tons per hour. The average specific gravity of the tailing solids is 2.70. Based on an average solid content of 35% by weight with the remaining 65% being water, the tailing flow from the mill is about 192 U.S.G.P.M.

The tailing solids will be extremely fine with 80% by weight passing through 325 mesh. A particle size distribution curve is attached in Appendix "A". Besides solids, the tailing will contain some chemicals such as sodium cyanide, lime etc. (see section 7 on Cyanide Content).

3. WATER BALANCE

The average rainfall in this area is about 12 inches per year. Assuming 40% loss due to interception, infiltration, temporary storage etc., the run-off to the tailing pond is about 7.2 inches per year. The drainage area of the pond is approximately 270 acres. With no surface stream flowing into the basin, the pond will only collect direct run-off from the rainfall which is equivalent to 162 ac.-ft. per year. The water in the tailing will be deposited in the pond at a rate of about 160 U.S.G.P.M. or 247.5 ac.-ft. per year. Therefore the total gain of water in the pond is approximately 409.5 ac.-ft. per year.

The seepage loss from the pond will be controlled to a minimum and can be neglected. For a self-contained system, no overflow from the pond will be allowed. Therefore the only other losses from the system will be through evaporation and reclaim. The annual evaporation rate is

about 56 inches in this area. Subtracting this amount of loss from the total gain, the remaining water can be reclaimed back to the mill. The rate of reclaim flow will depend on the surface area of the pond. For a pond surface area of 40 acres, the available reclaim water is about 139 ac.-ft. per year or 90 U.S.G.P.M.

4. HYDROLOGY OF POND

In the tailing pond area, the surface soil material can be classified as clayey, silty sand with gravels in depth. The infiltration rate through this material is generally slow. The site is currently vacant and covered by varying amounts of native grasses and sagebushes. No perennial streams are present in this area. Slope of land ranges from approximately 15% to less than 5% in this area. A unit run-off hydrograph was produced based on the above-mentioned condition for a storm with 7 inches in 1 hour intensity. (The hydrograph was included in the soil investigation report by F.M. Fox and Associates). This hydrograph was reduced to a 1 inch - 1 hour unit hydrograph for simulating the run-off from the design storm.

The probable maximum 6 hours storm was taken as the design storm for this project. No data was available regarding the 6 hour PMP in this area. However, at a nearby watershed of similar size and drainage characteristics, the 6 hour PMP is 11 inches. It is assumed the same precipitation can be expected in this area. The 6 hours PMP was assumed to occur according to following sequence of events:

PERIOD	PRECIPITATION
1st hour	10% 1.10 in.
2nd hour	12% 1.32 in.
3rd hour	15% 1.65 in.
4th hour	38% 4.18 in.
5th hour	14% 1.54 in.
6th hour	11% 1.21 in.

The design inflow will be from direct run-off only and no overflow will be allowed. The run-off was calculated using the 1 inch - 1 hour hydrograph and graphical method. The total run-off from the 6 hour PMP is about 125 ac.-ft. The freeboard of the dam will be designed to accommodate this inflow. The raise of water level that may be expected at each stage of embankment development is as follows:

Stage 1, 3.50 ft; Stage 2, 2.5 ft.; and Stage 3, 2.5 ft.

The values computed correspond to the 3 stages at their respective maximum tailing elevations. The dam will be designed to have a minimum freeboard of 5 feet.

5. TAILING DAM & POND

a) Storage Capacity

The anticipated life of the mine, based on the proven ore deposits, is 10 years. With an average mill rate of 500 STPD, the total tailing

solids produced is about 1,750,000 short tons. At the end of the mining operation, the mill will continue custom milling for another 5 years at the same production rate. The overall solids produced is therefore 2,625,000 short tons.

The tailing deposits have been assumed to have a void ratio of about 0.9 giving a total volume of tailing of 60,000,000 cu. ft. or 1377 ac.-ft. The capacity of the pond will be designed to store all the tailings and run-off into the pond with no overflow.

b) Construction Stages

The dam will be constructed in three stages. The estimated capacities for the impoundment are as follows:

Stage 1:	Capacity of Pond	20×10^6 cu.ft.
	Surface Area	33 ac.
	Embankment Height	37 ft.
Stage 2:	Capacity of Pond	40×10^6 cu.ft.
	Surface Area	48 ac.
	Embankment Height	48 ft.
Stage 3:	Capacity of Pond	60×10^6 cu.ft.
	Surface Area	58 ac.
	Embankment Height	56 ft.

The first stage will be completed before milling commences. The second stage will be completed before the end of the 5th year. The last stage will be ready at the end of the 10th year.

c) Construction of Dam

A detailed "Geotechnical Investigation" was conducted by F.M. Fox and Associates for the proposed tailing disposal area. A copy of their report is included with this application. Generally, their recommendations will form the basic criteria of the embankment design and construction. (A tentative construction specification is also included in Fox's report).

Material present at the tailing pond site will be used for embankment construction. The fill will be placed in lifts and compacted to the required minimum density. Dam foundation and pond bottom will be removed of all organic material. The top soil material in the impoundment area will be saved and stock-piled near the pond site for future rehabilitation use. The finished dam section will have an up-stream and down-stream slope of 2 : 1 and 3 : 1 respectively. The factor of safety based on this design was estimated to be 2.80 for static condition and 2.08 for pseudo-static condition.

d) Seepage Control

It is estimated that the water table lies about 250 feet below the impoundment area. In order to prevent seepage loss to the groundwater system, a liner of clay material will be placed over the entire pond

foundation and extended to cover the up-stream slope of the dam. According to the Fox report, material found in the pond site area can be used as the lining material provided that the coarse material were removed. The selected liner should contain 35% minus 200 mesh material. The permeability of this material is about 5.67×10^{-7} cm/sec. The tailing solids, with a permeability of about 1×10^{-6} cm/sec., will also act as a seepage control layer when it builds up to a sufficient thickness. A seepage calculation based on this information has concluded that the moisture from the tailing will never reach the groundwater system.

6. TAILING PIPELINES

a) Discharge Line

Tailing from the mill will be pumped through a pipeline to the storage pond. In order to protect the up-stream face of the dam from the moisture in the tailing, a starter dyke will be constructed. The pipe will be laid on the dyke discharging tailing towards the far end of the pond. Since the quantity and rate of flow is so small, a single discharge point will be used. The location of the point will be adjusted periodically along the dyke to fill the full capacity of the pond. When the tailing deposits reach the top of the dyke, additional fill will be brought in to raise it, in about 10 feet intervals.

b) Reclaim Line

Decant water from the pond will be reclaimed back to the mill for process use. A decant line with small riser pipes attached at regular intervals will be laid along the bottom of the pond. As the solids build up in the pond, the risers will be capped off to avoid the admission of solids into the reclaim line. Water skimmed off from the surface will be transported back to the mill through a gravity system.

The reclaim line will be laid across the dam foundation. Seepage collars will be installed around the pipe to ensure no piping effect will occur.

c) Environment Protection

The tailing and reclaim pipeline were designed to have constant uphill grade from the mill. Thus when necessary, the full contents of the lines can be drained back to the mill. Both pipes will have, next to the concentrator, a branch which will allow the tailing and reclaim water to be dumped into the Pachuca Basin in an emergency. The content of the basin can be pumped back to the tailing system when the emergency state is over. Again, the system is self-contained.

To protect against any pipe breakage along the discharge and reclaim lines, the pipes will be installed in a half-shell culvert which will be laid on the ground. The culvert will be self-draining back to the Pachuca Basin. The spillage from the pipe, therefore, will be isolated from the environment.

The tailing pond will be surrounded by hog-wire fence in order to protect the wildlife in this area.

7. CYANIDE CONTENT

The tailing is actually produced by adding water to a concentrated waste solids and water mixture coming out from the final filtration process, i.e., the filter cake residue. If fresh water is used for re-pulping the cake, the total cyanide in the tailing will be 330 PPM of which 80% is free cyanide. In the tailing pond, about 75% of the cyanide present in the water will be destroyed by ultra violet light and other mechanism. Depends on the amount of run-off and evaporation, the concentration of cyanide in the reclaim water will vary. It is expected that this concentration will not exceed 100 PPM. The reclaim water will be used for the re-pulping of filter cake whenever possible. The ultimate grade of cyanide in the tailing including those from the reclaim water will be 440 PPM total cyanide of which 80% will be free cyanide.

8. REHABILITATION PROGRAM

Tailing solids will consolidate in the pond under its own weight. The water content will decrease from 65% to about 25% by weight.

After the milling process is completed, the tailing pond will be rehabilitated by covering the surface with the top-soil material stock-piled on the site. It is planned to re-seed the whole area. The type of vegetation used will be selected to best suit the environment and the soil condition.

P.S. Lo,
Civil Division.

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Attachments.